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(Calcutta, 1918), 672–674; Review by E. H. B. of C. V. Raman's *On the mechanical theory of the vibrations of bowed strings and of musical instruments of the violin family, with experimental verification of the results*, Part I (Calcutta, 1918), 683. [Quotations: "Helmholtz on an experimental basis was able to construct a partial theory of the bowed string. F. Krigar Menzel and A. Raps photographed, upon a revolving drum carrying a film, various points of bowed strings so as to exhibit their displacement-time graphs. E. H. Barton and his pupils took simultaneous photographs of the behaviour of the strings and either bridge, belly or air of a monochord or violin. But in none of the foregoing cases was a direct mechanical theory of the string, bridge, etc., attempted. This is now done by C. V. Raman.

"The equations of motion of the string are written and solved for the case of a periodic force applied transversely by the bow at any given position. The equations of motion of the bridge are next written and dealt with. The *modus operandi* of the bow is afterwards examined and a simplified kinematical theory of the bowed string is based upon it. . . . Another interesting subject here treated is that of the effect of the *mute*, which, by loading the bridge, enfeebles and veils the tone of the instrument. . . . This work contains twenty-eight figures in the text and twenty-six excellent full-page photographic reproductions, and well deserves the careful attention of those interested in such a notable contribution to an important subject."]

SCIENTIA, volume 84, April, 1919: "Synthèses et visions d'histoire de la science" by A. Mieli, 310–313; [Discussion of topic with special reference to three works: S. Günther, *Geschichte der Naturwissenschaften*, 2 little volumes, Leipzig, Reclam; F. Dannemann, *Die Naturwissenschaften in ihrer Entwickelung und ihrem Zusammenhang*, 4 volumes, 1910–1913; and W. Libby, *An Introduction to the History of Science*, New York, 1918.] Review by G. Scorza of Borel's *Introduction géométrique à quelques théories physiques* (Paris, 1914) and Borel's *Leçons sur les fonctions monogènes uniformes d'une variable complexe* (Paris, 1917), 314–316; Review by R. Marcolongo of Whittaker's *A Treatise on the analytical dynamics of particles and rigid bodies* (Cambridge, 1917).

SCIENTIFIC AMERICAN SUPPLEMENT, volume 87, April 5, 1919: "A scientific coin problem. How some mysterious numerical effects can be produced" by T. L. De Land, 220.

TEXAS MATHEMATICS TEACHER'S BULLETIN, volume 4, no. 3, May, 1919: "Summer school courses in mathematics," 3–6; "Number systems and numerals" by Phillis Henry, 7–10; "Saving time and gaining efficiency in teaching trigonometry" by Goldie P. Horton, 11–14; "A few facts about mathematics" by P. M. Batchelder, 15–17; "Bibliography of the teaching of mathematics" by C. D. Rice, 18–20; "Methods *vs.* results and mathematical induction" by A. A. Bennett, 21–28; "A trigonometric solution of the irreducible case of the cubic equation with applications" by C. E. Brand, 29–34; "Checking the solution of an equation" and "Familiar tricks based on literal arithmetic," 35–38—[Reprinted from W. F. White's *A Scrap Book of Elementary Mathematics*]; "The Pentagram during 1918–1919" by Goldie P. Horton, 39–40; "The straight edge," 41.

TÔHOKU MATHEMATICAL JOURNAL, volume 15, nos. 1–2, March, 1919: "On a determinate system of non-independent trials" by M. Watanabe, 1–134; "Sur l'équation $x_1^5 + x_2^5 + x_3^5 + \cdots + x_k^5 = 0$" by A. Filippov, 135–145; "On closed curves described by a spherical pendulum" by A. Emch, 146–165; "On a transformation theorem relating to spheroidal harmonics" by B. Datta, 166–171; "On certain mean curves defined by the series of orthogonal functions" by K. Ogura, 172–180; "A remark on the dynamical system with two degrees of freedom" by K. Ogura, 181–183; "A contribution to the question of linear dependence in linear integral equations" by L. J. Rouse, 184–216.

ZEITSCHRIFT FUR MATHEMATISCHEN UND NATURWISSENSCHAFTLICHEN UNTERRICHT ALLER SCHULGATTUNGEN, volume 49, no. 12, December, 1918: "Die Entwicklung des Satzes vom vollständigen Vierseit und Viereck zu einem Grundpfeiler des natürlichen Systems der Geometrie" by W. Dieck, 329–341; "Über die Anwendung beweglicher Figuren im geometrischen Unterricht" by Elisabeth K. Staiger, 341–348; Reviews of Neuendorff's *Praktische Mathematik*, 2. Teil (Leipzig, 1918), and of Seyffarth's *Elementarmathematik zum Gebrauch an Lehrerbildungsanstalten*, 1. Teil: Allgemeine Arithmetik und Algebra, 5. Auflage (Dresden–Blasewitz, 1917).

AMERICAN DOCTORAL DISSERTATIONS.

GILLIE A. LAREW, *Necessary conditions in the problems of Mayer in the calculus of variations*. Pp. 1–22. [Reprinted from *Transactions of the American Mathematical Society*, 1919.] (Chicago, 1916.)

A. S. MERRILL, *An isoperimetric problem with variable end-points*. Pp. 60–78. [Reprinted from *American Journal of Mathematics*, 1919.] (Chicago, 1916.)

PAULINE SPERRY, *Properties of a certain projectively defined two-parameter family of curves on a general surface.* Pp. 213–214. [Reprinted from *American Journal of Mathematics,* 1918.] (Chicago, 1916.)

UNDERGRADUATE MATHEMATICS CLUBS.

EDITED BY U. G. MITCHELL, University of Kansas, Lawrence.

CLUB ACTIVITIES.

BARNARD COLLEGE MATHEMATICS CLUB, Columbia University, New York, N. Y. [*1918,* 226–227].

The officers of the club for 1918–19 are: Honorary president, Professor Edward Kasner; president, Janet Meneely '19; vice-president, Veronica Jentz '20; secretary, Georgia Schaaf '19; treasurer, Evelyn Baldwin; program committee: Gretchen Torek '19, Catherine Piersall '20, Marian Haskell '21.

The following are programs of meetings for 1918–19:

November 19, 1918: "Theory of ballistics" by Professor Edward Kasner.
December 16: "Descartes" by Alice Johnson '21 and Marian Haskell '21; "Leibniz" by Helen Clarke '20; "Newton" by Mimosa Pfaltz '19.
January 14, 1919: "Occupations open to women taking mathematics" by Ellen Leut '18.
February 18: "Cycloids" by George W. Mullins, instructor in mathematics.
March 11: "Physics and mathematics" by Elaine Kennard '20; "Relation of curves to physics" by Catherine Piersall '29.
April 16: "Accounting" by Professor Wildman, New York University.
May: Business meeting.

DENISON MATHEMATICS CLUB, Denison University, Granville, Ohio. [*1918,* 403–04].

The officers of the club for the year 1918–19 are: President, Edgar King '19; vice-president, Esther Weaver '20; secretary-treasurer, Fern Whitney '21.

The programs for the first part of the year 1919 were as follows:

January 21, 1919: "The significance of mathematics" (excerpts from a paper by Professor Cassius J. Keyser[1]) by Professor Anna B. Peckham.
February 4: "Parallel coördinates" by Professor Forbes B. Wiley.
February 18: "Mathematics in artillery" by Lieut. R. Thompson '21.
March 4: "Fundamentals in mathematics" by Professor Charles C. Morris, Ohio State University.
March 18: "Parallel coördinates" (continued) by Professor Wiley.
April 15: "Centrodes" by Esther Weaver '20; "Magic squares" by Alva Shumaker '22.
April 29: "Applications of mathematics to astronomy" by Professor Paul Biefeld, department of astronomy, Denison University; election of officers.

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[1] "The Human Significance of Mathematics," *Science,* new ser., Vol. 42, No. 1089 (Nov. 12, 1915), pp. 663–680.